



INSTRUCTION MANUAL

FFX-2 STEREO ELECTRONIC CROSSOVER

CROWN INTERNATIONAL, INC. 1718 W. MISHAWAKA RD. ELKHART, INDIANA 46517

The information furnished in this manual does not include all of the details of design, production, or variations of the equipment. It does not cover all the possible contingencies which may arise during operation, installation, or maintenance. Should special problems arise, or further information be desired, please contact the Crown International Customer Services Department.

Crown International
1718 W. Mishawaka Rd.
Elkhart, Indiana 46517
Ph: (219) 294-8000

WARNING

**TO PREVENT SHOCK OR FIRE HAZARD DO NOT EXPOSE TO RAIN
OR MOISTURE!**

CAUTION

**TO PREVENT ELECTRIC SHOCK DO NOT USE THIS (POLARIZED)
PLUG WITH AN EXTENSION CORD, RECEPTACLE OR OTHER
OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO
PREVENT BLADE EXPOSURE.**

ATTENTION

**POUR PREVENIR LES CHOCS ELECTRIQUES NE PAS UTILISER
CETTE FICHE POLARISEE AVEC UN PROLONGATEUR. UNE PRISE
DE COURANT OU UNE AUTRIE SORTIE DE COURANT, SAUF SI LES
LAMES PEUVENT ETRE INSEREES A FOND SANS EN LAISSER
AUCUNE PARTIE A DECOUVERT.**



CROWN
INTERNATIONAL, INC.
FULL THREE-YEAR WARRANTY



SUMMARY OF WARRANTY

We, CROWN INTERNATIONAL, INC., 1718 West Mishawaka Road, Elkhart, Indiana 46517-4095 warrant to you, the ORIGINAL PURCHASER and ANY SUBSEQUENT OWNER of each NEW Crown product, for a period of three (3) years from the date of purchase by the original purchaser (the "warranty period") that the new Crown product is free of defects in materials and workmanship, and we further warrant the new Crown product regardless of the reason for failure, except as excluded in this Crown Warranty.

ITEMS EXCLUDED FROM THIS CROWN WARRANTY

This Crown Warranty is in effect only for failure of a new Crown product which occurred within the Warranty Period. It does not cover any product which has been damaged because of any intentional misuse, accident, negligence, or loss which is covered under any of your insurance contracts. This Crown Warranty also does not extend to the new Crown product if the serial number has been defaced, altered, or removed.

WHAT THE WARRANTOR WILL DO

We will remedy any defect, regardless of the reason for failure (except as excluded), by repair, replacement, or refund. We may not elect refund unless you agree, or unless we are unable to provide replacement, and repair is not practical or cannot be timely made. If a refund is elected, then you must make the defective or malfunctioning product available to us free and clear of all liens or other encumbrances. The refund will be equal to the actual purchase price, not including interest, insurance, closing costs, and other finance charges less a reasonable depreciation on the product from the date of original purchase. Warranty work can only be performed at our authorized service centers or at the Crown factory. We will remedy the defect and ship the product from the service center or our Crown factory within a reasonable time after receipt of the defective product at our authorized service center or our Crown factory. All expenses in remedying the defect, including surface shipping costs in the United States, will be borne by us. (You must bear the expense of shipping the product between any foreign country and the port of entry in the United States and all taxes, duties, and other custom's fee for such foreign shipments.)

HOW TO OBTAIN WARRANTY SERVICE

You must notify us of your need for warranty service not later than ninety (90) days after expiration of the warranty period. All components must be shipped in a factory pack, which, if needed, may be obtained from us free of charge. Corrective action will be taken within a reasonable time of the date of receipt of the defective product by us or our authorized service center. If the repairs made by us or our authorized service center are not satisfactory, notify us or our authorized service center immediately.

DISCLAIMER OF CONSEQUENTIAL AND INCIDENTAL DAMAGES

YOU ARE NOT ENTITLED TO RECOVER FROM US ANY INCIDENTAL DAMAGES RESULTING FROM ANY DEFECT IN THE NEW CROWN PRODUCT. THIS INCLUDES ANY DAMAGE TO ANOTHER PRODUCT OR PRODUCTS RESULTING FROM SUCH A DEFECT. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATIONS OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

WARRANTY ALTERATIONS

No person has the authority to enlarge, amend, or modify this Crown Warranty. This Crown Warranty is not extended by the length of time which you are deprived of the use of the new Crown product. Repairs and replacement parts provided under the terms of this Crown Warranty shall carry only the unexpired portion of this Crown Warranty.

DESIGN CHANGES

We reserve the right to change the design of any product from time to time without notice and with no obligation to make corresponding changes in products previously manufactured.

LEGAL REMEDIES OF PURCHASER

THIS CROWN WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE. No action to enforce this Crown Warranty shall be commenced later than ninety (90) days after expiration of the warranty period.

THIS STATEMENT OF WARRANTY SUPERSEDES ANY OTHERS CONTAINED IN THIS MANUAL.

 **CROWN**
1718 W. Mishawaka Road, Elkhart, IN 46517
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1.1 Introduction

The Crown FFX-2 is an inexpensive, state-of-the-art stereo electronic crossover with fixed crossover frequencies. The crossover frequencies can be pre-set by changing plug-in resistors; however, this should be done by qualified personnel only. This arrangement results in a low cost for such a high-performance device. In stereo mode, the FFX-2 provides 18 dB/octave, 2-way (hi-low) filters. In mono mode, it provides 3-way (hi-mid-low) filters.

The FFX-2 installs in a standard 19-inch rack. Inputs and outputs are balanced screw terminals, inverting or non-inverting.

The unit is ideal for fixed installations by contractors because the screw terminals accept crimp-on cable connectors or direct wire. There are no controls for the client to misadjust.

In addition, the FFX-2 can function as an excellent mono subwoofer-combining crossover for recording studio or club applications. It also is the crossover of choice for fixed-setting portable sound-reinforcement systems.

1.2 Service Policies

Due to the sophisticated circuitry of your unit, only qualified, fully trained technicians should be allowed to service it. Please observe the following label on the unit:

CAUTION: TO PREVENT ELECTRIC SHOCK DO NOT OPEN. NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO A QUALIFIED TECHNICIAN.

For service, return the unit to the factory in the original packing or in replacement packing obtainable from the Crown factory. For warranty service, the unit must be returned to the factory or an approved service station (Amcron customers consult your local representative). In either case, fill out and enclose the Service Information form located at the rear of this manual. This will help to ensure a speedy and effective response.

Crown will pay shipping costs (in the U.S.) for warranty service upon receiving copies of all shipping receipts.

Before returning your unit to the factory for service, authorization should be obtained from the Crown Technical Service Department. All shipments should be sent UPS or truck freight (insured). The factory will then return your serviced unit by one of the above methods.

Upon receipt of the warranty registration card from your dealer, Crown will register your unit on our computer warranty file.

Retain your copy of the bill of sale from your Crown dealer. This is your proof of purchase.

When you need service for your unit from an authorized Crown Service Station, simply present your bill of sale. With it, the service station can promptly initiate any needed paperwork. It will save you time and effort.

The bill of sale is also your proof of ownership should you need it for insurance or legal reasons.



SECTION 2 SPECIFICATIONS AND PERFORMANCE

2.1 General Specifications

Filter type: 18dB/octave highpass and lowpass.

Frequency response: 20Hz to 20,000Hz +/- .1dB.

Noise: -100dB (10V reference, 20Hz to 20,000Hz).

Distortion: Less than 0.05% I.M. and T.H.D.

Gain: Unity (for balanced connections as sent from the factory).

-6dB (for unbalanced connections as sent from the factory).

Unity (for unbalanced connections if R102, R103, R202 and R203 are removed).

+6dB (for balanced connections if R102, R103, R202 and R203 are removed).

Input/output connectors: 20-pin barrier block (screw terminals), balanced inputs and outputs.

Input impedance: 20 kilohms balanced; 10 kilohms unbalanced.

Output impedance: 600 ohms balanced.

Polarity: Output terminal marked + is in phase with input terminal marked +. Output polarity may be reversed by reversing + and - leads.

Power requirements: 120VAC (90 to 132VAC), 50-60Hz.

Display: LED power indicator (pilot light).

Construction: All-steel chassis, top cover and back panel. Aluminum front panel.

Finish: Carbide black front panel, splatter-coat black chassis and top cover.

Dimensions: 19 inches wide (standard rack mount), 6.5 inches deep, 1¾ inches high (48.3cm x 16.5cm x 4.45cm).

Weight: 4 lbs. 5 oz. (595g).



SECTION 3 INSTALLATION AND OPERATION

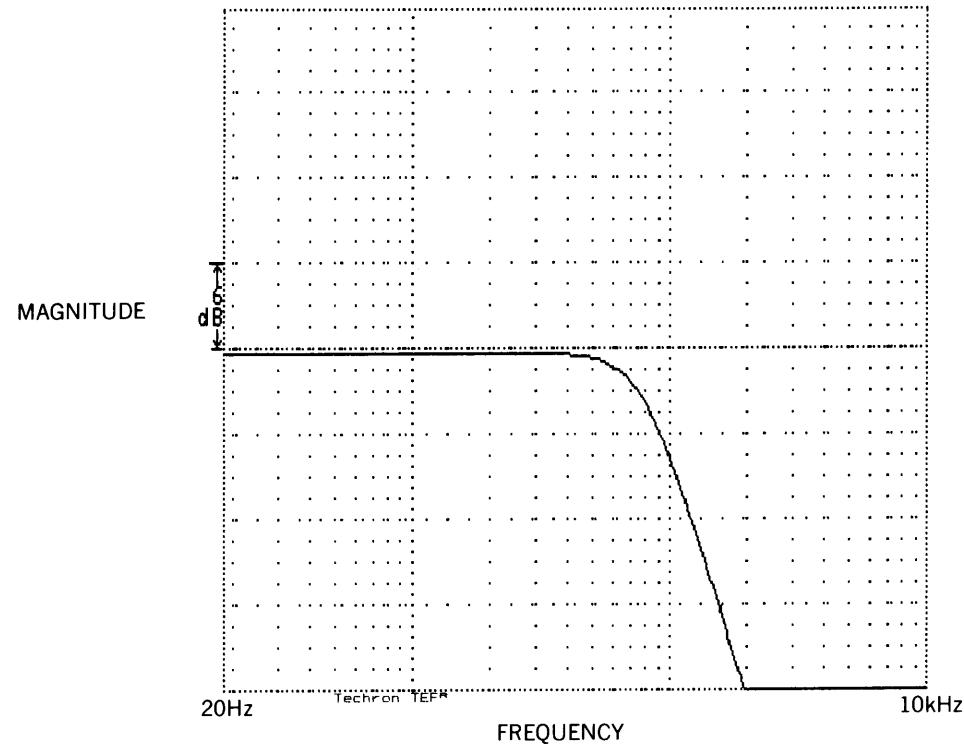


Fig. 2.1 Frequency Response - Lowpass 800Hz Crossover Frequency

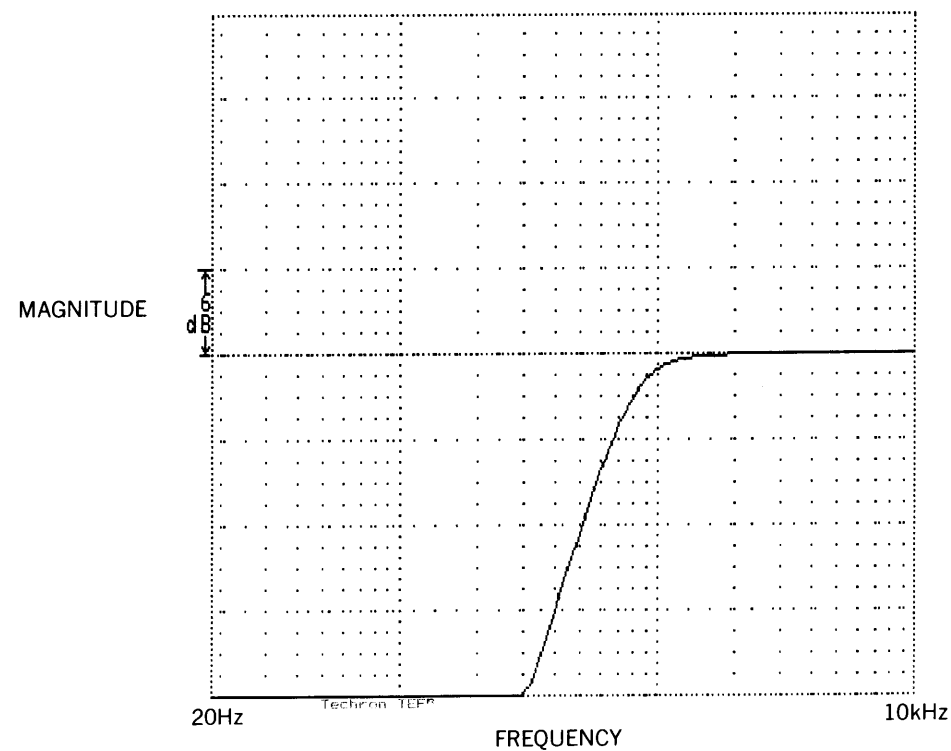


Fig. 2.2 Frequency Response - Highpass 800Hz Crossover Frequency

3.1 Unpacking

As soon as the unit is received, please inspect for any damage incurred in transit. Since the unit was carefully inspected and tested at the factory, it left unmarred. If damage is found, notify the transportation company immediately. Only the consignee may institute a claim with the carrier for damage during shipment. However, Crown will cooperate fully in such an event. Be sure to save the carton as evidence of damage for the shipper's inspection.

Even if the unit arrived in perfect condition, as most do, it is advantageous to save the packing materials. They will prove valuable in preventing damage should there ever be occasion to transport or ship the unit. Note the carton and internal pack - each is designed for protection during transit. **DO NOT SHIP THE UNIT WITHOUT THIS FACTORY PACK!**

3.2 Setting the Crossover Frequencies

CAUTION: THIS SECTION INVOLVES RISK OF ELECTRIC SHOCK AND SHOULD THEREFORE BE ATTEMPTED BY QUALIFIED PERSONNEL ONLY.

The FFX-2 is factory-set to an 800Hz crossover frequency in stereo mode. If you need to change the frequency, proceed as follows:

1. Remove the top cover by removing the screws from both sides of the chassis.
2. On the printed-circuit board are twelve resistors (6040 ohms each) installed in sockets. These resistors are R105, R107, R109, R111, R113, R115, R205, R207, R209, R211, R213, and R215. The resistors numbered R107 through R115 are for Ch. 1; those numbered R205 through R215 are for Ch. 2.
3. With the unit unplugged from power, use a needle-nose pliers to remove the resistors mentioned above from their sockets. Refer to Fig 3.1 for their locations.

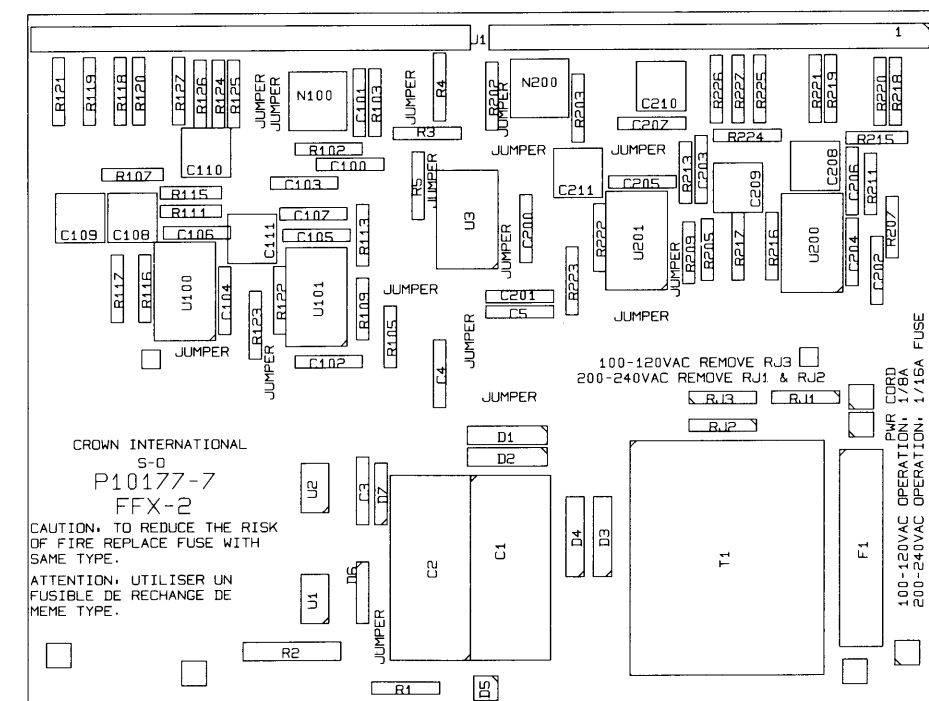


Fig. 3.1 FFX-2 Component Layout

4. Select the appropriate resistor value for the desired crossover frequency, as shown in Chart 3.1. **Note:** For hi-low stereo operation, the resistors for Ch. 1 and 2 should be the same. For hi-mid-low mono operation, choose the lower crossover frequency for Ch. 1 and the upper crossover frequency for Ch. 2.

5. For reference, Fig. 3.2 shows how to read a resistor color code. Replace the resistors you just removed with twelve resistors of the value(s) you selected. Bend the resistor leads at a right angle to the resistor body, cut them 1/4" long, and plug them into the vacated sockets.

Note: The enclosed factory pack includes twelve each of 9.6 kilohm resistors for a 500Hz crossover, and 47.5 kilohm resistors for a 100Hz crossover.

Also note: The FFX-2 comes from the factory with unity gain for balanced connections. To achieve unity gain with unbalanced connections (or 6dB gain for balanced connections), remove R102, R103, R202 and R203.

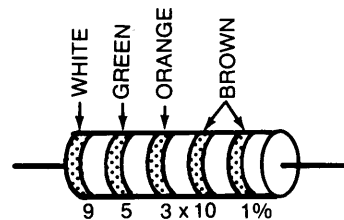
6. Replace the chassis cover.

Desired Crossover Frequency (Hz)	Resistance Value (K ohms)
50	96.5
60	80.4
70	68.9
80	60.3
90	53.6
100	47.5
150	31.1
200	24.1
250	19.3
300	16.1
350	13.8
400	12.0
450	10.7
500	9.6
600	8.0
700	6.9
800	6.0
900	5.4
1000	4.8
1500	3.21
2000	2.4
2500	1.93
3000	1.6
4000	1.2
5000	1.0
6000	.82
7000	.68
8000	.62
9000	.56
10000	.47

$R = 1 / (2 \pi F C)$ where: R is resistance in ohms
 π is 3.14
 F is crossover frequency in Hz
 C is circuit capacitance (0.033uF)

Chart 3.1 Value of Resistors for Desired Crossover Frequency

EXAMPLE:



9530 OHMS OR 9.53K OHMS
 1% TOLERANCE

Resistor Color Code				
Significant Figures (First, Second and Third Band)				
Black	0			
Brown	1			
Red	2			
Orange	3			
Yellow	4			
Green	5			
Blue	6			
Violet	7			
Gray	8			
White	9			
		Multiplier (Fourth Band)		
Black	1	Blue	1,000,000	Resistance Tolerance (Fifth Band)
Brown	10	Violet	10,000,000	
Red	100	Gray	100,000,000	
Orange	1,000	White	1,000,000,000	
Yellow	10,000			
Green	100,000			Silver 10%
				Gold 5%
				Red 2%
				Brown 1%

1% tolerance is suggested. Resistors with 5% or 10% tolerance have two (instead of three) Significant Figures. The third band is the multiplier and the fourth band is the tolerance.

Fig. 3.2 How to Read a Resistor Color Code

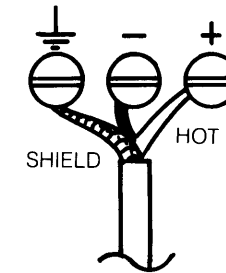
3.3 Installation

Install the FFX-2 in a standard 19-inch rack. Dimensions are 19 inches wide, 6.5 inches deep, and 1 3/4 inches high (48.3cm x 16.5cm x 4.45cm).

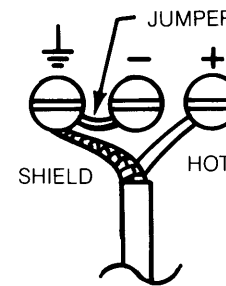
3.4 Connections For Stereo Highpass/Lowpass Operation

Fig. 3.3 shows in general how to make connections to the FFX-2. For **balanced** connections to the FFX-2 inputs and outputs, use 2-conductor shielded cable. Connect the cable shield to the ground terminal; connect the signal hot lead to +, and connect the signal return lead to -.

BALANCED INPUT AND OUTPUT CONNECTIONS



UNBALANCED CONNECTIONS TO FFX-2 INPUTS



UNBALANCED CONNECTIONS TO FFX-2 OUTPUTS

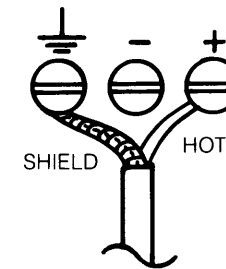


Fig. 3.3 Screw-Terminal Connections

For **unbalanced** connections to the FFX-2 **inputs**, install a jumper wire between the - terminal and the ground terminal. Connect the cable shield to the ground terminal, and connect the signal hot lead to the + terminal.

For **unbalanced** connections to the FFX-2 **outputs**, connect the cable shield to the ground terminal, and connect the signal hot lead to the + terminal. Do not use the - terminal.

Please refer to Fig. 3.4 for the following connections:

1. Connect your mixer Ch.1 output to the FFX-2 Ch.1 input.
2. Connect your mixer Ch.2 output to the FFX-2 Ch.2 input.
3. Connect the FFX-2 lowpass (LP) outputs of both channels to both inputs of your low-frequency power amplifier.
4. Connect the FFX-2 highpass (HP) outputs (both channels) to both inputs of your high-frequency power amplifier.

3.5 Connections for Mono Highpass/Bandpass/Lowpass Operation

Fig. 3.3 shows in general how to make connections to the FFX-2. For **balanced** connections to the FFX-2 inputs and outputs, use 2-conductor shielded cable. Connect the cable shield to the ground terminal; connect the signal hot lead to +, and connect the signal return lead to -.

For **unbalanced** connections to the FFX-2 **inputs**, install a jumper wire between the - terminal and the ground terminal. Connect the cable shield to the ground terminal, and connect the signal hot lead to the + terminal.

For **unbalanced** connections to the FFX-2 **outputs**, connect the cable shield to the ground terminal, and connect the signal hot lead to the + terminal. Do not use the - terminal.

Please refer to Fig 3.5 for the following connections:

1. Set Ch.1 to the lower bandpass frequency by plugging in the appropriate resistors.
2. Set Ch.2 to the upper bandpass frequency by plugging in the appropriate resistors.
3. Connect your mixer output to the FFX-2 Ch.1 input.
4. Using 2-conductor shielded cable, connect the FFX-2 Ch.1 HP output to the FFX-2 Ch.2 input. Be careful to maintain the signal polarity.
5. Connect the FFX-2 Ch.1 LP output to the input of your low-frequency amplifier.
6. Connect the FFX-2 Ch.2 HP output to the input of your high-frequency amplifier.
7. Connect the FFX-2 Ch.2 LP output to the input of your mid-frequency amplifier.

In summary, Ch.1 LP is lowpass; Ch.2 HP is highpass, and Ch.2 LP is bandpass.

Fig. 3.4 Connections for Stereo Highpass/Lowpass

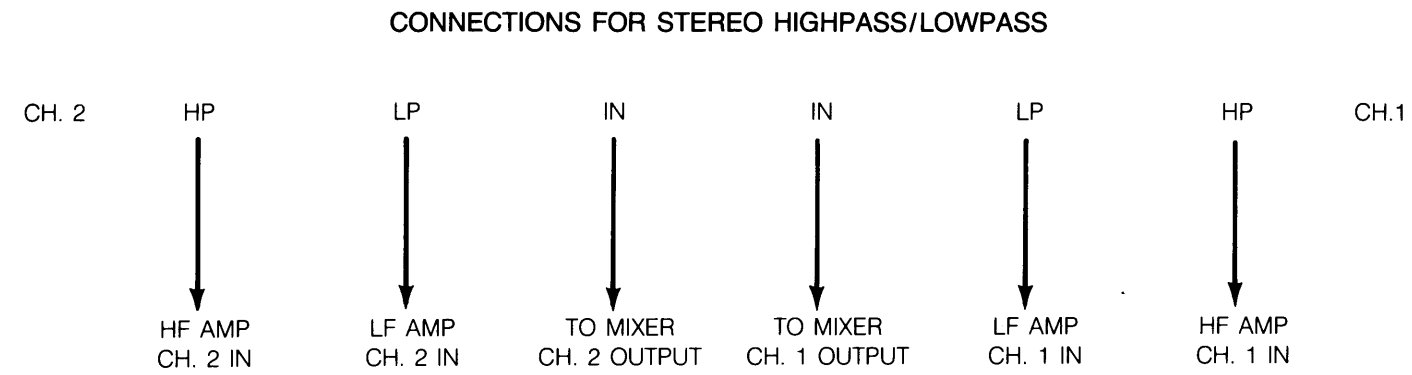


Fig. 3.5 Connections for Highpass/Bandpass/Lowpass

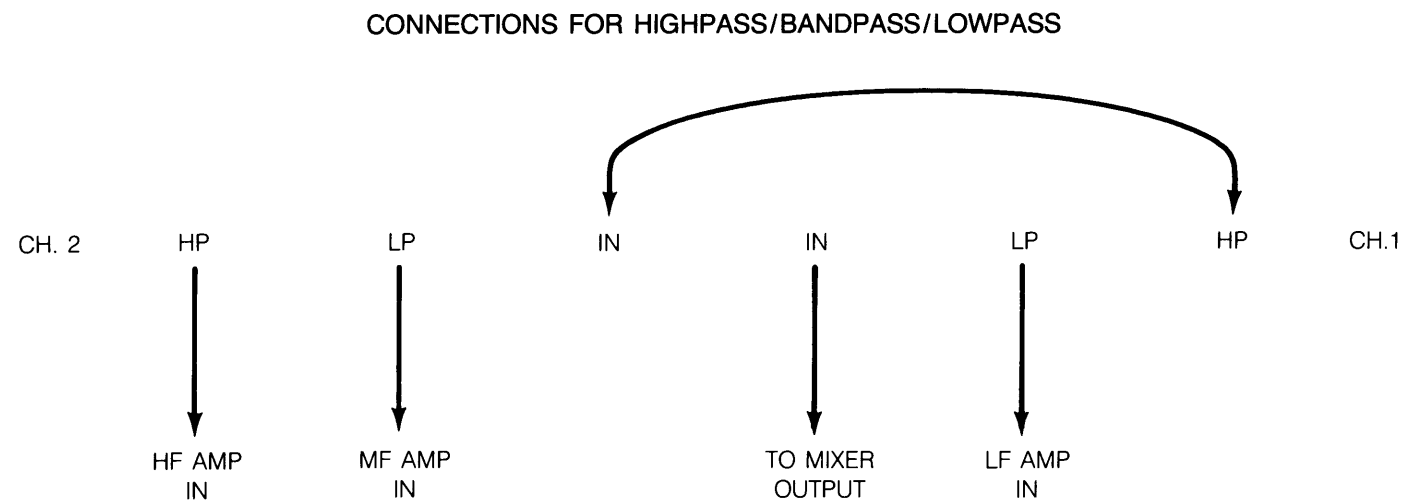
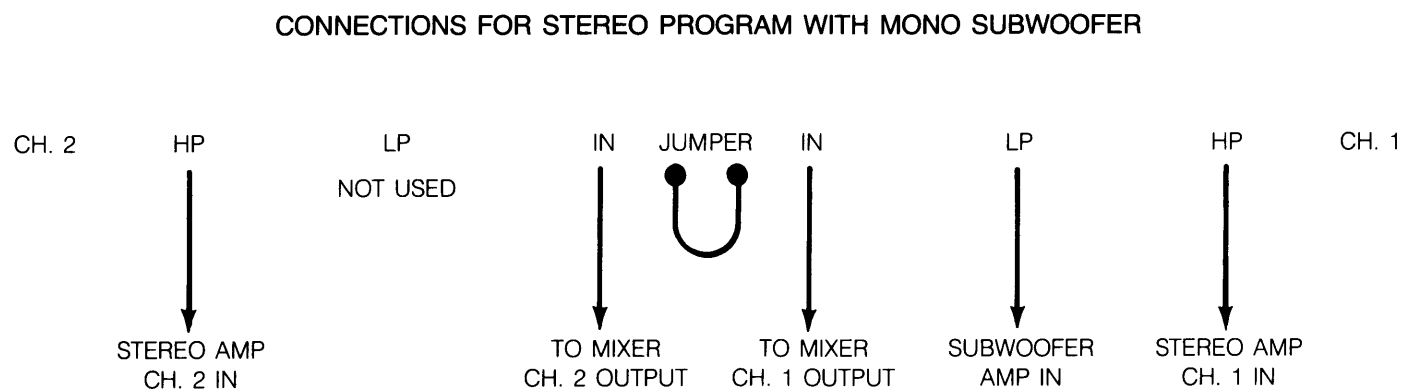


Fig. 3.6 Connections for Stereo Program with Mono Subwoofer



3.6 Connections for Stereo Program With Mono Subwoofer

Fig. 3.3 shows in general how to make connections to the FFX-2. For **balanced** connections to the FFX-2 inputs and outputs, use 2-conductor shielded cable. Connect the cable shield to the ground terminal; connect the signal hot lead to +, and connect the signal return lead to -.

For **unbalanced** connections to the FFX-2 **inputs**, install a jumper wire between the - terminal and the ground terminal. Connect the cable shield to the ground terminal, and connect the signal hot lead to the + terminal.

For **unbalanced** connections to the FFX-2 **outputs**, connect the cable shield to the ground terminal, and connect the signal hot lead to the + terminal. Do not use the - terminal.

Please refer to Fig. 3.6 for the following connections:

1. On the back panel of the FFX-2 is a note, "JUMPER FOR MONO OPERATION." Install a jumper wire between the two designated terminals.
2. Connect your mixer Ch.1 output to the FFX-2 Ch.1 input.
3. Connect your mixer Ch.2 output to the FFX-2 Ch.2 input.
4. Connect the FFX-2 Ch.1 LP output to the input of your subwoofer amplifier.
5. Connect the FFX-2 Ch.1 HP output to the Ch.1 input of your stereo amplifier.
6. Connect the FFX-2 Ch.2 HP output to the Ch.2 input of your stereo amplifier.
7. Do not make connections to the FFX-2 Ch.2 LP output.

In summary, the FFX-2 Ch.1 LP output is the mono subwoofer signal, and the FFX-2 HP outputs are the stereo signals.

3.7 Operation

Plug the power cord into a 110VAC outlet. The outlet voltage can be 90V to 132VAC. The amber LED pilot light will turn on, indicating that the unit is receiving power.

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SECTION 4 TECHNICAL INFORMATION

4.1 Block Diagram Circuit Theory

Please refer to Fig. 4.1. For simplicity, only Ch.1 is shown.

The balanced input signal goes through a balanced-to-unbalanced converter. The output of the converter feeds three active 6dB/octave highpass filters in series, as well as three active 6dB/octave lowpass filters in series. For each filter output, the signal is fed through an inverter to achieve a balanced output.

For mono highpass/bandpass/lowpass operation, Ch.1 is set to the lower bandpass frequency and Ch.2 is set to the upper bandpass frequency. The highpass output of Ch.1 is externally connected to the input of Ch.2. Because both channels are wired in series, a bandpass filter is formed with its output at the Ch.2 low pass output terminals.

For mono subwoofer operation, an external jumper connects the output of the Ch.2 balanced-to-unbalanced converter in parallel with the output of the Ch.1 balanced-to-unbalanced converter. The mono mix of these two signals is fed to the Ch.1 lowpass-filter input.

A power supply provides +/-18VDC to power the circuitry.

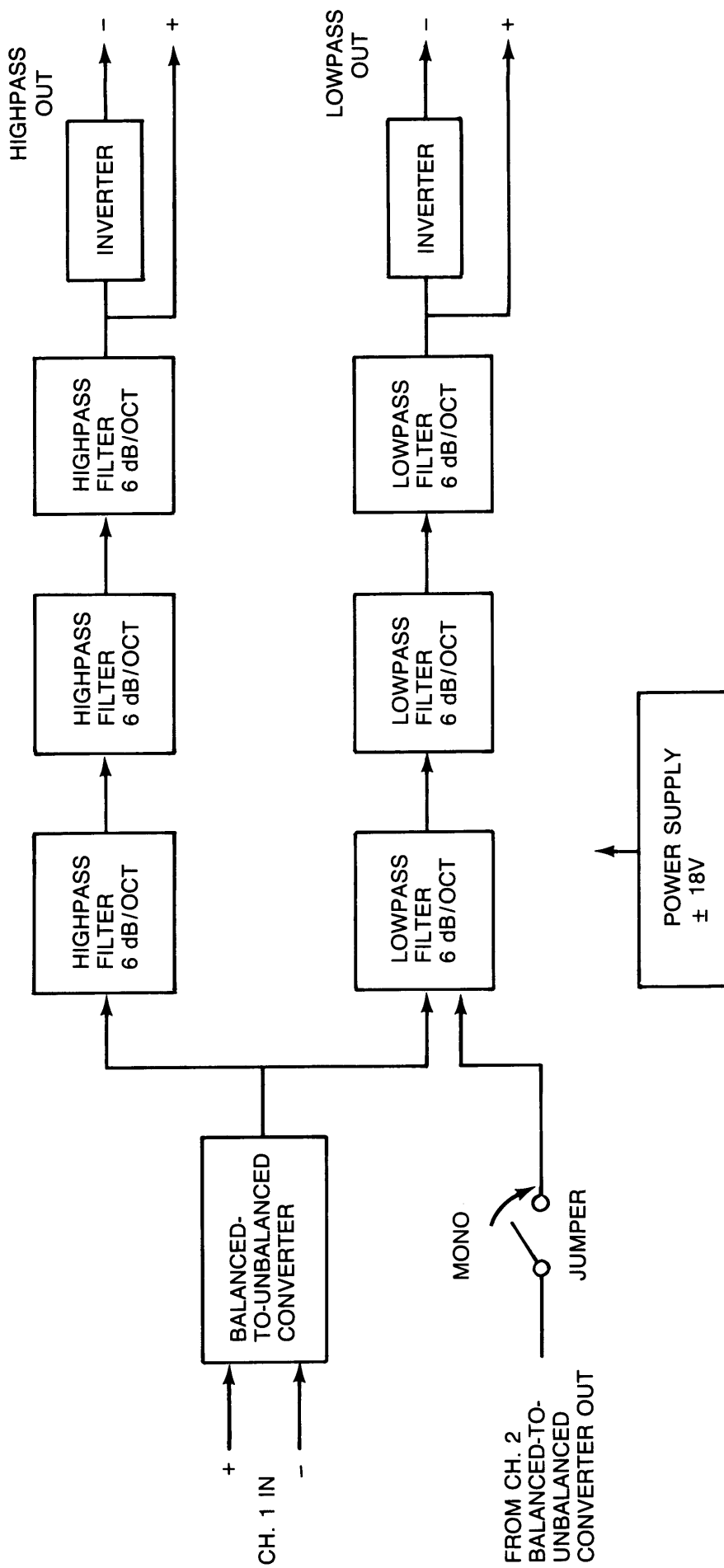
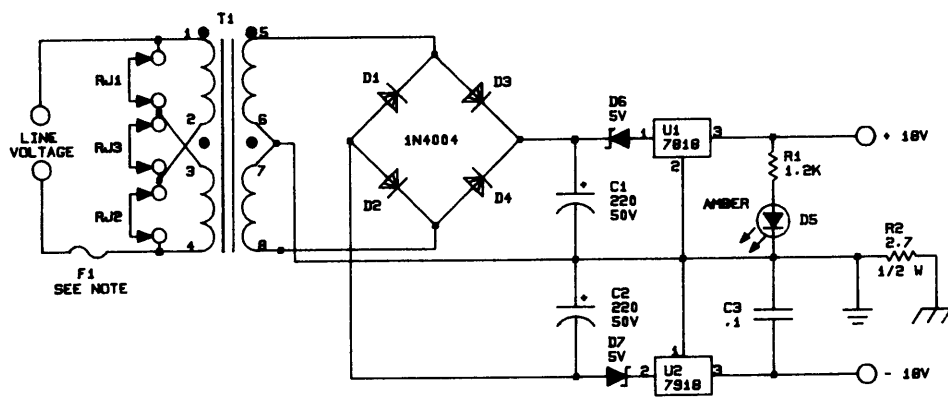
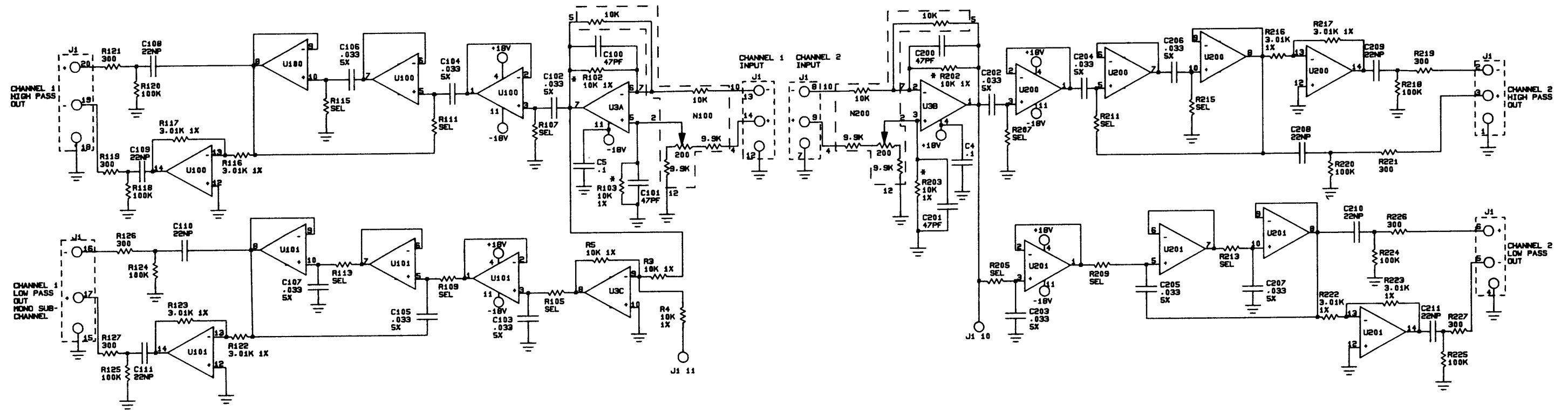


Fig. 4.1 Block Diagram

NOTE:

THIS IS A REPRESENTATIVE SCHEMATIC ONLY AND DOES NOT NECESSARILY REFLECT THE EXACT CIRCUITRY OF YOUR UNIT. PLEASE REFER TO THE RESPECTIVE SERVICE MANUAL FOR SPECIFIC TECHNICAL INFORMATION.



FFX-2
J0217-0
 11/86

- NOTES:
- UNLESS OTHERWISE SPECIFIED
 - ALL RESISTORS IN OHMS.
 - ALL CAPACITORS IN MICROFARADS.
 - ALL 1/4 WATT RESISTORS 5X.
 - ALL ICs ARE HA4741
 - FOR MONO OPERATION CONNECT J1(11) TO J1(10)
 - OUTPUT AT CHANNEL 1 LOW PASS
 - FOR 120VAC LINE VOLTAGE, REMOVE RJ3, & USE 1/8 AMP FUSE(F1).
 - FOR 240VAC LINE VOLTAGE, REMOVE RJ1 & RJ2, & USE 1/16 AMP FUSE(F1).
 - SEL - SELECTED RES VALUES
 - IF R102,103, AND R202,203 ARE 10K 1X
 - UNITY GAIN BAL OUT
 - IF R102,103 AND R202,203 ARE REMOVED
 - +6DB GAIN BAL OUT

DESIGNER CROSSOVER FREQUENCY (HZ)	REL. IMPEDANCE (RESISTOR)
100 HZ	47.5 1X
500 HZ	9.53 1X
800 HZ	6.04 1X